

**SOLICITATION/CONTRACT/ORDER FOR COMMERCIAL ITEMS  
OFFEROR TO COMPLETE BLOCKS 12, 17, 23, 24, & 30**

2. CONTRACT NO.		3. AWARD/EFFECTIVE DATE	4. ORDER NUMBER	1. REQUISITION NUMBER 10-0074-03		PAGE 1 OF 9	
7. FOR SOLICITATION INFORMATION CALL:		a. NAME Dian Lockamy, 202-767-3782		5. SOLICITATION NUMBER N00173-03-R-DL06		6. SOLICITATION ISSUE DATE 04/10/03	
9. ISSUED BY CONTRACTING OFFICER NAVAL RESEARCH LABORATORY ATTN: CODE: 3220.dl WASHINGTON DC 20375-5326		CODE		b. TELEPHONE NUMBER (No collect calls) 202-767-3782		8. OFFER DUE DATE/ LOCAL TIME 5/12/03	
10. THIS ACQUISITION IS <input checked="" type="checkbox"/> UNRESTRICTED <input type="checkbox"/> SET ASIDE: % FOR <input type="checkbox"/> SMALL BUSINESS <input type="checkbox"/> SMALL DISAV. BUSINESS <input type="checkbox"/> 8(A) SIC: 333314 SIZE STANDARD: 500				11. DELIVERY FOR FOB DESTINATION UNLESS BLOCK IS MARKED <input type="checkbox"/> SEE SCHEDULE		12. DISCOUNT TERMS	
				13a. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700) <input checked="" type="checkbox"/>			
				13b. RATING D0-C9			
				14. METHOD OF SOLICITATION <input type="checkbox"/> RFQ <input type="checkbox"/> IFB <input checked="" type="checkbox"/> RFP			
15. DELIVER TO CODE				16. ADMINISTERED BY CODE			
17a. CONTRACTOR/ OFFEROR CODE				18a. PAYMENT WILL BE MADE BY CODE			
TELEPHONE NO. <input type="checkbox"/> 17b. CHECK IF REMITTANCE IS DIFFERENT AND PUT SUCH ADDRESS IN OFFER				18b. SUBMIT INVOICES TO ADDRESS SHOWN IN BLOCK 18a UNLESS BLOCK BELOW IS CHECKED <input type="checkbox"/> SEE ADDENDUM			
19. ITEM NO.	20. SCHEDULE OF SUPPLIES/SERVICES			21. QUANTITY	22. UNIT	23. UNIT PRICE	24. AMOUNT
	See Page 2						
(Attach Additional Sheets as Necessary)							
25. ACCOUNTING AND APPROPRIATION DATA						26. TOTAL AWARD AMOUNT (For Govt. Use Only)	
<input checked="" type="checkbox"/> 27a. SOLICITATION INCORPORATES BY REFERENCE FAR 52.212-1, FAR 52.212-4, FAR 52.212-3 AND 52.212-5 ARE ATTACHED. ADDENDA <input checked="" type="checkbox"/> ARE <input type="checkbox"/> ARE NOT ATTACHED							
<input type="checkbox"/> 27b. CONTRACT/PURCHASE ORDER INCORPORATES BY REFERENCE FAR 52.212-4, FAR 52.212-5 IS ATTACHED. ADDENDA <input type="checkbox"/> ARE <input type="checkbox"/> ARE NOT ATTACHED							
28. CONTRACTOR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN _____ COPIES TO ISSUING OFFICE. CONTRACTOR AGREES TO FURNISH AND DELIVER ALL ITEMS SET FORTH OR OTHERWISE IDENTIFIED ABOVE AND ON ANY ADDITIONAL SHEETS SUBJECT TO THE TERMS AND CONDITIONS SPECIFIED HEREIN.				29. AWARD OF CONTRACT: REFERENCE _____ OFFER <input type="checkbox"/> DATED _____ YOUR OFFER ON SOLICITATION (BLOCK 5), INCLUDING ANY ADDITIONS OR CHANGES WHICH ARE SET FORTH			
30a. SIGNATURE OF OFFEROR/CONTRACTOR				31a. UNITED STATES OF AMERICA (SIGNATURE OF CONTRACTING OFFICER)			
30b. NAME AND TITLE OF SIGNER		30c. DATE SIGNED		31b. NAME OF CONTRACTING OFFICER		31c. DATE SIGNED	
32a. QUANTITY IN COLUMN 21 HAS BEEN <input type="checkbox"/> RECEIVED <input type="checkbox"/> INSPECTED <input type="checkbox"/> ACCEPTED, AND CONFORMS TO THE CONTRACT, EXCEPT AS NOTED				33. SHIP NUMBER PARTIAL FINAL		34. VOUCHER NUMBER	
32b. SIGNATURE OF AUTHORIZED GOVT. REPRESENTATIVE				32c. DATE		35. AMOUNT VERIFIED CORRECT FOR	
				36. PAYMENT <input type="checkbox"/> COMPLETE <input type="checkbox"/> PARTIAL <input type="checkbox"/> FINAL		37. CHECK NUMBER	
41a. I CERTIFY THIS ACCOUNT IS CORRECT AND PROPER FOR PAYMENT				38. S/R ACCOUNT NUMBER		39. S/R VOUCHER NUMBER	
				40. PAID BY			
41b. SIGNATURE AND TITLE OF CERTIFYING OFFICER				41c. DATE		42a. RECEIVED BY (Print)	
				42b. RECEIVED AT (Location)			
				42c. DATE REC'D (YY/MM/DD)		42b. TOTAL CONTAINERS	

**1. CONTINUATION OF THE SF 1449 - SOLICITATION/CONTRACT/ORDER FOR COMMERCIAL ITEMS**

A. Blocks 19 - 24 are completed as follows:

Item No.	Schedule of Supplies/Services	Quantity	Unit	Unit Price	Amount
0001	Photolithographic Mask Aligner With Standard Commercial Warranty	1	Each	\$	\$
<b>OPTION 1</b> 0002	Spare Lamps	10	Ea	\$	\$
<b>OPTION 2</b> 0003	Laminar Flow Hood	1	Ea	\$	\$
<b>OPTION 3</b> 0004	Service Maintenance Contract	1	Lot	\$	\$

B. Block 25 is completed as shown on Page 1.

**2. ADDENDA TO FAR 52.212-4 CONTRACT TERMS AND CONDITIONS--COMMERCIAL ITEMS (FEB 2002)**

**A. REQUIRED DELIVERY OR PERIOD OF PERFORMANCE**

The required delivery is as follows:

ITEM NO.	QUANTITY	
0001	LOT	90 days after contract award
0002 through 0004	ALL	To be determined at time of exercise of option, if exercised

**B. OPTION(S)**

The Government may require delivery of the optional items by the contracting officer giving written notice any time prior to contract completion. The government reserves the right to exercise options at time of contract award.

**C. AUTHORIZED GOVERNMENT REPRESENTATIVES**

Authorized Government Representative (AGR) for Inspection and Acceptance- \* ,Code \*  
,Telephone number \* .

Security Matters- Contracting Officer for Security, Code 1221, (202) 767-2240, DSN 297-2240, email [security-group@nrl.navy.mil](mailto:security-group@nrl.navy.mil)

Safety Matters- Head Safety Branch, Code 3540, (202) 767-2232, DSN 297-2232, email [safety@nrl.navy.mil](mailto:safety@nrl.navy.mil)

\*(To be filled in at time of award)

**D. ELECTRONIC AND INFORMATION TECHNOLOGY (EIT)**

In accordance with Section 508 of the Rehabilitation Act of 1973 (29 U.S.C. 794d), all EIT supplies and services provided under this contract must comply with the applicable accessibility standards issued by the Architectural and Transportation Barriers Compliance Board at 36 CFR part 1194 (see FAR Subpart 39.2). Electronic and information technology (EIT) is defined at FAR 2.101.

**E. REQUIREMENTS FOR ON-SITE CONTRACTORS**

For those portions of the work under this contract performed at any NRL site, the contractor shall comply with the Requirements for On-Site Contractors dated 01 October 2002, which are hereby incorporated by reference. The full text is available at <http://heron.nrl.navy.mil/contracts/home.htm>.

**3. FAR 52.212-5 CONTRACT TERMS AND CONDITIONS REQUIRED TO IMPLEMENT STATUTES OR EXECUTIVE ORDERS--COMMERCIAL ITEMS (MAY 2002)**

(a) The Contractor shall comply with the following FAR clauses, which are incorporated in this contract by reference, to implement provisions of law or executive orders applicable to acquisitions of commercial items:

- (1) 52.222-3, Convict Labor (E.O.11755).
- (2) 52.233-3, Protest after Award (31 U.S.C 3553).

(b) The Contractor shall comply with the FAR clauses in this paragraph (b) that the Contracting Officer has indicated as being incorporated in this contract by reference to implement provisions of law or Executive orders applicable to acquisitions of commercial items or components:

*(Contracting Officer must check as appropriate.)*

- ☒ (1) 52.203-6, Restrictions on Subcontractor Sales to the Government, with Alternate I (41 U.S.C.253g and 10 U.S.C.2402).
- ☐ (2) 52.219-3, Notice of HUBZone Small Business Set-Aside (Jan 1999)
- ☒ (3) 52.219-4, Notice of Price Evaluation Preference for HUBZone Small Business Concerns (Jan 1999) *(if the offeror elects to waive the preference, it shall so indicate in its offer)*
- ☐ (4) (i) 52.219-5, Very Small Business Set-Aside (Pub. L. 103-403, section 304, Small Business Reauthorization and Amendments Act of 1994)
- ☐ (ii) Alternate I to 52.219-5
- ☐ (iii) Alternate II to 52.219-5
- ☒ (5) 52.219-8, Utilization of Small Business Concerns (15 U.S.C.637 (d)(2) and (3)).
- ☐ (6) 52.219-9, Small Business Subcontracting Plan (15 U.S.C.637 (d)(4)).
- ☐ (7) 52.219-14, Limitations on Subcontracting (15 U.S.C.637(a)(14)).
- ☐ (8) (i) 52.219-23, Notice of Price Evaluation Adjustment for Small Disadvantaged Business Concerns (Pub. L. 103-355, section 7102, and 10 U.S.C. 2323) *(if the offeror elects to waive the adjustment, it shall so indicate in its offer)*
- ☐ (ii) Alternate I of 52.219-23.
- ☐ (9) 52.219-25, Small Disadvantaged Business Participation Program - Disadvantaged Status and Reporting (Pub L. 103-355, section 7102, and 10 U.S.C. 2323).
- ☐ (10) 52.219-26, Small Disadvantaged Business Participation Program - Incentive Subcontracting (Pub. L. 103-355, section 7102, and 10 U.S.C. 2323).
- ☐ (11) 52.222-21, Prohibition of Segregated Facilities (Feb 1999)
- ☒ (12) 52.222-26, Equal Opportunity (E.O.11246).
- ☒ (13) 52.222-35, Equal Opportunity for Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans (38 U.S.C.4212).
- ☒ (14) 52.222-36, Affirmative Action for Workers with Disabilities (29 U.S.C.793).
- ☒ (15) 52.222-37, Employment Reports on Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans (38 U.S.C.4212).
- ☐ (16) 52.222-19, Child Labor – Cooperation with Authorities and Remedies (E.O. 13126).
- ☐ (17) (i) 52.223-9, Estimate of Percentage of Recovered Material Content for EPA-Designated Products (42 U.S.C. 6962(c)(3)(A)(ii)).
- ☐ (ii) Alternate I of 52.223-9 (42 U.S.C. 6962(i)(2)(C)).

- ☒ (18) 52.225-1, Buy American Act --Supplies (41 U.S.C.10a -- 10d).
- ☐ (19) (i) 52.225-3, Buy American Act --North American Free Trade Agreement-- Israeli Trade Act (41 U.S.C.10a --10d, 19 U.S.C.3301 note, 19 U.S.C. 2112 note).
- ☐ (ii) Alternate I to 52.225-3.
- ☐ (iii) Alternate II to 52.225-3.
- ☐ (20) 52.225-5, Trade Agreements (19 U.S.C. 2501, *et seq.*, 19 U.S.C. 3301 note).
- ☒ (21) 52.225-13, Restriction on Certain Foreign Purchases (E.O. 12722, 12724, 13059, 13067, 13121, and 13129).
- ☒ (22) 52.225-15, Sanctioned European Union Country End Products (E.O.12849).
- ☐ (23) 52.225-16, Sanctioned European Union Country Services (E.O.12849).
- ☒ (24) 52.232-33, Payment by Electronic Funds Transfer -- Central Contractor Registration (31 U.S.C. 3332).
- ☐ (25) 52.232-34, Payment by Electronic Funds Transfer --Other than Central Contractor Registration (31 U.S.C. 3332).
- ☐ (26) 52.232-36, Payment by Third Party (31 U.S.C. 3332).
- ☐ (27) 52.239-1, Privacy or Security Safeguards (5 U.S.C.552a).
- ☐ (28) (i) 52.247-64, Preference for Privately Owned U.S.-Flag Commercial Vessels (46 U.S.C.1241).
- ☐ (ii) Alternate I of 52.247-64.

(c) The Contractor shall comply with the FAR clauses in this paragraph (c), applicable to commercial services, which the Contracting Officer has indicated as being incorporated in this contract by reference to implement provisions of law or executive orders applicable to acquisitions of commercial items or components:

*(Contracting Officer check as appropriate.)*

- ☐ (1) 52.222-41, Service Contract Act of 1965, As Amended (41 U.S.C.351, *et seq.*).
- ☐ (2) 52.222-42, Statement of Equivalent Rates for Federal Hires (29 U.S.C.206 and 41 U.S.C.351, *et seq.*).
- ☐ (3) 52.222-43, Fair Labor Standards Act and Service Contract Act -- Price Adjustment (Multiple Year and Option Contracts) (29 U.S.C.206 and 41 U.S.C.351, *et seq.*).

- ☐ (4) 52.222-44, Fair Labor Standards Act and Service Contract Act - Price Adjustment (29 U.S.C.206 and 41 U.S.C.351, *et seq.*).
- ☐ (5) 52.222-47, SCA Minimum Wages and Fringe Benefits Applicable to Successor Contract Pursuant to Predecessor Contractor Collective Bargaining Agreement (CBA) (41 U.S.C.351, *et seq.*).

(d) *Comptroller General Examination of Record.* The Contractor shall comply with the provisions of this paragraph (d) if this contract was awarded using other than sealed bid, is in excess of the simplified acquisition threshold, and does not contain the clause at 52.215-2, Audit and Records -- Negotiation.

(1) The Comptroller General of the United States, or an authorized representative of the Comptroller General, shall have access to and right to examine any of the Contractor's directly pertinent records involving transactions related to this contract.

(2) The Contractor shall make available at its offices at all reasonable times the records, materials, and other evidence for examination, audit, or reproduction, until 3 years after final payment under this contract or for any shorter period specified in FAR Subpart 4.7, Contractor Records Retention, of the other clauses of this contract. If this contract is completely or partially terminated, the records relating to the work terminated shall be made available for 3 years after any resulting final termination settlement. Records relating to appeals under the disputes clause or to litigation or the settlement of claims arising under or relating to this contract shall be made available until such appeals, litigation, or claims are finally resolved.

(3) As used in this clause, records include books, documents, accounting procedures and practices, and other data, regardless of type and regardless of form. This does not require the Contractor to create or maintain any record that the Contractor does not maintain in the ordinary course of business or pursuant to a provision of law.

(e) Notwithstanding the requirements of the clauses in paragraphs (a), (b), (c) or (d) of this clause, the Contractor is not required to include any FAR clause, other than those listed below (and as may be required by an addenda to this paragraph to establish the reasonableness of prices under Part 15), in a subcontract for commercial items or commercial components --

- (1) 52.222-26, Equal Opportunity (E.O.11246);
- (2) 52.222-35, Equal Opportunity for Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans (38 U.S.C.4212);
- (3) 52.222-36, Affirmative Action for Workers with Disabilities (29 U.S.C.793);
- (4) 52.247-64, Preference for Privately-Owned U.S.- Flag Commercial Vessels (46 U.S.C.1241) (flow down not required for subcontracts awarded beginning May 1, 1996) and
- (5) 52.222-41, Service Contract Act of 1965, As Amended (41 U.S.C. 351, *et seq.*).

**4. 252.212-7001 -- CONTRACT TERMS AND CONDITIONS REQUIRED TO IMPLEMENT STATUTES OR EXECUTIVE ORDERS APPLICABLE TO DEFENSE ACQUISITIONS OF COMMERCIAL ITEMS. (MAR 2003)**

- (a) The Contractor agrees to comply with the following Federal Acquisition Regulation (FAR) clause which, if checked, is included in this contract by reference to implement a provision of law applicable to acquisitions of commercial items or components.

☒ 52.203-3 Gratuities (APR 1984) (10 U.S.C. 2207).

- (b) The Contractor agrees to comply with any clause that is checked on the following list of Defense FAR Supplement clauses, which, if checked, is included in this contract by reference to implement provisions of law or Executive orders applicable to acquisitions of commercial items or components.

☐ 252.205-7000 Provision of Information to Cooperative Agreement Holders (DEC 1991) (10 U.S.C. 2416).

☐ 252.206-7000 Domestic Source Restriction (DEC 1991) (10 U.S.C. 2304).

☐ 252.219-7003 Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan (DoD Contracts) (APR 1996) (15 U.S.C. 637).

☐ 252.219-7004 Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan (Test Program) (JUN 1997) (15 U.S.C. 637 note).

☒ 252.225-7001 Buy American Act and Balance of Payments Program (MAR 1998) (41 U.S.C. 10a-10d, E.O. 10582).

☐ 252.225-7012 Preference for Certain Domestic Commodities (FEB 2003) (10 U.S.C. 2533a).

☐ 252.225-7014 Preference for Domestic Specialty Metals (MAR 1998) (10 U.S.C. 2533a).

☐ 252.225-7015 Preference for Domestic Hand or Measuring Tools (DEC 1991) (10 U.S.C. 2533a).

☐ 252.225-7016 Restriction on Acquisition of Ball and Roller Bearings (DEC 2000)  
☐ (Alternate I) (DEC 2000) (Section 8064 of Public Law 106-259).

☐ 252.225-7021 Trade Agreements (OCT 2002) (19 U.S.C. 2501-2518 and 19 U.S.C. 3301 note).

☐ 252.225-7027 Restriction on Contingent Fees for Foreign Military Sales (MAR 1998) (22 U.S.C. 2779).

- ☐ 252.225-7028 Exclusionary Policies and Practices of Foreign Governments (DEC 1991) (22 U.S.C. 2755).
- ☐ 252.225-7029 Preference for United States or Canadian Air Circuit Breakers (AUG 1998) (10 U.S.C. 2534(a)(3)).
- ☐ 252.225-7036 Buy American Act--North American Free Trade Agreement Implementation Act--Balance of Payments Program (MAR 1998)  
☐ (Alternate I) (SEP 1999) (41 U.S.C. 10a-10d and 19 U.S.C. 3301 note).
- ☐ 252.227-7015 Technical Data--Commercial Items (NOV 1995) (10 U.S.C. 2320).
- ☐ 252.227-7037 Validation of Restrictive Markings on Technical Data (SEP 1999) (10 U.S.C. 2321).
- ☒ 252.232-7003 Electronic Submission of Payment Requests (MAR 2003) (10 U.S.C. 2227)
- ☐ 252.243-7002 Requests for Equitable Adjustment (MAR 1998)(10 U.S.C. 2410).
- ☐ 252.247-7023 Transportation of Supplies by Sea (MAY 2002)  
☐ (Alternate I) (MAR 2000)  
☐ (Alternate II) (MAR 2000) (10 U.S.C. 2631).
- ☐ 252.247-7024 Notification of Transportation of Supplies by Sea (MAR 2000) (10 U.S.C. 2631).
- (c) In addition to the clauses listed in paragraph (e) of the Contract Terms and Conditions Required to Implement Statutes or Executive Orders--Commercial Items clause of this contract (FAR 52.212-5), the Contractor shall include the terms of the following clauses, if applicable, in subcontracts for commercial items or commercial components, awarded at any tier under this contract:  
 252.225-7014 Preference for Domestic Specialty Metals, Alternate I (MAR 1998) (10 U.S.C. 2241 note).  
 252.247-7023 Transportation of Supplies by Sea (MAY 2002) (10 U.S.C. 2631).  
 252.247-7024 Notification of Transportation of Supplies by Sea (MAR 2000) (10 U.S.C. 2631).

**FAR:**

- 52.203-8 Cancellation, Rescission, and Recovery of Funds for Illegal or Improper Activity (JAN 1997)
- 52.217-04 Evaluation of Options Exercised at Time of Contract Award (JUN 1988)



**DFARS:**

252.204-7004 Required Central Contractor Registration (NOV 2001)

**5. CONTRACT DOCUMENTS, EXHIBITS OR ATTACHMENTS:**

1. Statement of Work/Specifications – 5 Pages
2. Accounting and Appropriation Data – 1 Page\*  
(\* To be included at time of award)

**6. ADDENDUM TO FAR 52.212-1 INSTRUCTIONS TO OFFERORS- COMMERCIAL ITEMS (OCT 2000)**

The Government intends to award a contract resulting from this solicitation to that responsible offeror proposing the lowest price for the Supplies or Services that has been determined to comply with the requirements of the solicitation.

**8. OFFEROR REPRESENTATIONS AND CERTIFICATIONS**

Offeror must complete and submit with its proposal, FAR 52.212-3 (JUL 2002) *Offeror Representations and Certifications--Commercial Items* and DFARS 252.212-7000 *Offeror Representations and Certifications--Commercial Items* (NOV 1995)., which are available electronically in full text at : <http://heron.nrl.navy.mil/contracts/rep&certs.htm>

Use Commercial Item Representations and Certifications: B

## **Specifications for Photolithographic Mask Aligner System**

### **Section 1. General Requirements**

**1.1 Scope.** This specification describes the minimum technical requirements and the minimum acceptable performance standards for a photolithographic mask aligner system to be installed by the contractor at the Naval Research Laboratory (NRL), Washington, DC. This system will be used by NRL personnel to transfer patterns from a mask to a wafer or substrate using contact lithography. The mask aligner will be placed in a multiple user facility and must provide ease of operation and safety to those in the facility.

**1.2 Installation Site.** The contractor shall install the mask aligner in Bldg. 250, Naval Research Laboratory, Washington DC 20375, at a specific location to be designated by the Authorized Government Representative (AGR). The laboratory space will have 110 volts alternating current (VAC) and 220 VAC, single phase, 60 Hertz (Hz) electrical power within a class 100 clean room. The contractor shall hook up the system to the required facilities available in the designated location. The contractor shall install the system in a manner consistent with typical clean-room operating procedures.

**1.3 Description and Primary System Components.** The photolithographic mask aligner is to be used to transfer patterns from a glass or quartz mask to a wafer or substrate using contact lithography. This process utilizes ultraviolet (UV) light to define a pattern in photoresist that, with subsequent processing, allows the construction of 2-dimensional devices having edges defined with submicrometer resolution. More complicated devices will be constructed using multiple 2-dimensional levels, and the relative alignment between levels will be 0.5 microns or better. This system will be used in a clean-room environment by a restricted group of trained operators. The system is to be composed of three major components. 1) A mechanical stage supporting the sample and mask and allowing alignment to be carried out between the two, 2) an optical source and an exposure system capable of delivering mid UV radiation to the sample for a programmable period of time, and 3) a microscope system to be used during alignment of the sample to the mask. The requirements for each of these components are as follows:

### **Section 2. Mechanical Subsystem Requirements**

**2.1 Sample size.** The mask aligner must be capable of handling a variety of sample sizes, including but not limited to 2 inches (in.) diameter and 3 in. diameter wafers up to 3 millimeter (mm) thick, 3 mm x 3 mm square substrates, and of handling different sample thicknesses (up to 3 mm thick) having square edges and dimensions up to 2 in. Section 1.1 describes the facility as a multiple user facility. In order to obtain the optimum number of users per day, it must take no more than 5 minutes for NRL users to change mask or sample holders.

2.2 Mask holder. The mask aligner must accept 4 in. square glass and quartz masks and retain the mask using a vacuum holder. A separate switch, which actuates the vacuum for the mask, is required. Vacuum to the holder is to be maintained even if instrument power is turned off.

2.3 Mask alignment. The system must allow relative mask - sample motion in x,y and  $\theta$  directions. The x-y plane is defined as the plane of the mask,  $\theta$  is the angle measured from the x-axis in the x-y plane. Required motional range in the x and y directions is at least 6 mm with an accuracy of 0.5  $\mu\text{m}$  or better.  $\theta$  range is to be at least  $6^\circ$ . The system must automatically compensate for mask/sample non-planarity; ball and collet systems of obtaining planarity are not acceptable. Positioning of the sample or mask is to be micrometer-driven; chessman-type positional systems are not acceptable.

2.4 Mask - Sample separation. The mask aligner must allow a continuously variable separation between the mask and sample in the z direction with a minimum range of at least 50  $\mu\text{m}$  to allow for alignment positioning. Mask-to-sample separation must be met over the full range of sample sizes specified in paragraph 2.1.

2.5 x-y shift z-movement. The shift in the x and/or y directions (relative to the mask) occurring as a result of motion of the sample over the full range of z must be less than 0.1  $\mu\text{m}$ , absolute.

## 2.6 Contact Modes.

2.6.1 Contact Modes - Description. The contact mode refers to the nature of the wafer/sample contact during exposure. Soft contact mode refers to mechanical force applied to the wafer/substrate interface. Vacuum contact is effected by applying a vacuum to the interface region between the mask and substrate. Hard contact is achieved by applying a pressurized gas against the face of the mask or the sample, allowing the transmission of a compressive force between the mask and sample.

2.6.2 Contact Modes - Requirements. The instrument is to provide soft, vacuum, and hard contact exposure modes. The force applied during the soft-contact mode shall be externally adjustable. Contact pressure during the hard contact operation shall be provided by a continuously adjustable throttle valve within a minimum range of 0 - 10 pounds per square inch (psi). A pressure gauge is required to display a readout of the pressure applied to the sample/mask interface during operation in the hard contact mode and of the chamber vacuum in the vacuum-contact mode. Pressure measurement is not required in the soft-contact mode.

2.7 Sample holder vacuum. The sample holder must have the capability for vacuum hold of the wafers and for vacuum contact during exposure. A separate switch that actuates the vacuum hold during transport of the wafer between the loading and exposure positions shall be provided for the sample holders.

### Section 3. Optical Subsystem

3.1 UV source requirement. The mask aligner is to utilize a mercury lamp, rated at a minimum of 350 W and using a power supply capable of operation at 110 VAC, 60 Hz power. A minimum of two spare lamps must to be provided. Power supply and lamphouse can be provided in separate units. The lamphouse must prevent accidentally exposing the laboratory environment to UV radiation. The power supply must be capable of recording cumulative lamp operating time.

3.2 UV spectral range. The mask aligner must be configured to operate in the mid-UV spectrum. Namely, it should provide spectral power in the range of 280-350 nanometers (nm), and spectral intensity in the wavelength region  $> 350$  nm is not to exceed 1% of total beam intensity.

3.3 Beam uniformity. The beam intensity variation is to be less than  $\pm 3\%$  over a 2 in. diameter area and less than  $\pm 5\%$  over a 3 in diameter area, measured in the plane of the mask. The beam shall have a light path including condenser lens, lens plates and final collimation lens to reduce the diffraction effects in the printed range.

3.4 Exposure timer. The exposure cycle must be automatic, activated by a simple switch or button, and time-programmable to between minimum ranges of 0.01 seconds to 99.99 hours.

3.5 Intensity control. The UV beam intensity variation must be less than  $\pm 2\%$  during exposure.

3.6 Intensity meters. An intensity meter must be included that monitors and displays UV source intensity during exposure. The meter is to be sensitive to radiation between 280 - 350 nm. A separate intensity meter must be provided to allow the operator to measure UV intensity in the 280 - 350 range at various points around the mask aligner, including the position of the mask.

3.7 Exposure Repeatability. Exposure repeatability, measured as the standard deviation in UV intensity between exposures, is not to exceed  $\pm 2\%$ . The standard deviation will be measured from a set of 20 exposures taken at 15-minute intervals over a 5-hour period.

3.8 Cold Light Mirror. The unit is to implement a "cold light mirror" to minimize heating of the substrate during long exposures.

3.9 Print resolution. The line resolution is to be 0.5  $\mu\text{m}$  or less, using vacuum contact, over the central 3 in. diameter area.

## Section 4. Microscope System

4.1 General description. The mask aligner must be equipped with a normal field microscope for viewing the mask - sample alignment. The microscope requires a four turret objective assembly.

4.2 Magnification requirements. Overall magnification range associated with the microscope must be from 50X (nominal) to a minimum of 200X, with a capability of 500X. Depth of focus at 200X or 500X is to be a minimum of 2  $\mu\text{m}$  corresponding to a resolution in the x-y plane of 0.5  $\mu\text{m}$ .

4.3 Positional Range. The microscope must provide independent motion in the x and y directions. A minimum travel in positive and negative x and y directions is 25 mm, having the origin at the centerpoint of the mask.

## Section 5. Miscellaneous

5.1 Manuals, drawings and documentation. One complete set of operating and technical manuals, including full instructions for all system hardware, must be provided. Schematics, diagrams, and drawings of the mask aligner must also be provided.

5.2 Special tools. Special tools required during normal operation or maintenance of the mask aligner is to be provided by the offeror.

5.3 Vibration isolation table. The contractor must provide a vibration isolation table for support of the mask aligner.

5.4 Commercial item. A developmental model is not acceptable, and only a system that has been commercially sold and available will be considered.

5.5.1 Demonstration. The contractor will demonstrate, to a small group of users (5 people), the full use and capability of the mask aligner at the installation site at NRL. A minimum of four hours will be scheduled at the installation site to meet this requirement.

## Section 6. Options

Option 1 - Spare lamps option. The contractor is to provide 10 spare lamps. The mercury lamp must be rated at a minimum of 350 W and using a power supply capable of operation at 110 VAC, 60 Hz power.

Option 2 - Laminar Flow Hood Option.

1. Laminar Flow Hood - General Description. The contractor is to furnish a laminar flow hood to provide a Class 10 atmosphere immediately around the mask aligner.

2. Dimensions. The flow hood is to be of the workbench type (without a table top) and enclose the mask aligner and vibration isolation table on its two sides, and on its back and top. Minimum clearance of 3 in. is required between the mask aligner and the side and back walls of the flow hood, and 8 in. clearance above the mask aligner is required. The mask aligner must fit completely under the ceiling of the flow hood and the front is to be free of obstacles to allow easy removal of the mask aligner for service. The flow hood must be less than 110 in. high.

3. Air Flow. The unit is to provide Class 10 laminar, vertical flow with a minimum flow rate of 600 cubic feet per minute. Input air can be drawn from the Class 1000 environment of the mask aligner system.

4. Power. The unit is to operate on 110 VAC, single phase, 60 Hz power.

5. Lighting. Lights are to be provided within the housing of the unit. Lights must be compatible with UV sensitive photoresist.

6. Location. The contractor shall install the laminar flow hood and the mask aligner in a Class 1000 clean room.

7. Certification. The contractor shall demonstrate and certify that the laminar flow hood produces a Class 10 atmosphere.

Option 3 - Service Maintenance Contract. The contractor must provide 3 preventive maintenance visits over a period of 12 months.